PATENT SPECIFICATION 1,061,702

DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Foamed Resin Insulating Materials.

We, MONSANTO CHEMICALS LIMITED, a British Company of Monsanto House, 10—18 Victoria Street, London, S.W.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to insulating materials and particularly to materials for the insulation of buildings. The invention is an improvement in or modification of the invention described in British Patent Specification No. 1,034,120.

British Patent Specification No. 1,034,120 describes *inter alia* a hollow extruded foamed thermoplastic resin having a cross-section in the form of a network of interconnected foamed resin elements. It has now been found that certain foamed resins of this kind are particularly useful for the insulation of buildings.

The invention comprises an insulating material suitable for laying between the beams, particularly the joists, of a roof or floor, comprising a flexible hollow extruded foamed polyolefin resin sheet having a cross-section in the form of a network of interconnected foamed polyolefin resin elements, an overall thickness of from ½ to 2 inches, and an overall width corresponding to the distance between the beams.

The invention also includes a building having a roof or floor that has been insulated by laying between the supporting beams an insulating material according to the invention, as well as a process of insulating in this way.

The polyolefin resin is one that has been obtained by polymerisation of an olefin, preferably one that contains not more than 4 carbon atoms in the molecule. Polyethylene is especially important, but for instance polypropylene is also useful, and the presence of a small quantity, for example up to 10% by weight, of a suitable comonomer such as for example vinyl chloride or vinyl acetate, is not excluded. A polyethylene can be produced by either a high-pressure or a low-pressure process, an example of the latter being a "Ziegler" process using an organometallic catalyst. Preferably, however, the polyolefin resin is a polyethylene produced by a high-pressure process.

Perspective views of two examples of insulating materials according to the invention are shown in Figures 1 and 2 of the accompanying drawings.

The material shown in Figure 1 is an extruded polyethylene sheet having a cross-section in the form of a rectangular network of interconnected foamed polyethylene elements, about 0.1 inch thick, (1), surrounding a series of approximately 0.3 inch square apertures (2) so that in effect the material consists of a bundle of hollow tubes having foamed polyethylene walls. The material has an overall thickness of approximately 1 inch and a width of approximately 14 inches. Its overall density is 1.6 pounds per cubic foot and that of the individual foamed elements is 3.7 pounds per cubic foot.

The material shown in Figure 2 is basically similar to that shown in Figure 1, but the cross-section is in the form of a network of foamed polyethylene elements (3) surrounding a series of grossly distorted triangular apertures (4).

The resin is in the form of an extruded foam, which can be made by extruding a foamable polyolefin resin composition containing a blowing agent. Any of the blowing agents mentioned in British Patent Specification No. 1,034,120, for example butane, can

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be employed, and there can also be present a nucleating agent, for example silica, as described in that specification.

Extrusion of the resin takes place through a die which needs to be of a type suitable for producing the foam having a cross-section in the form of a network. Preferably there is used a die as described in British Patent Specification No. 1,034,120, having at its outlet end a number of slits arranged in the form of a network, each slit having communicating with it a plurality of separate channels at the inlet end of the die. The number and configuration of the network of slits is of course chosen so as to correspond to the desired cross-section of the foamed resin. For example a rectangular or triangular grid can be employed, and the insulating materials shown in Figures 1 and 2 were produced using dies each having a network of slits and consisting respectively of a series of squares and of a series of six-pointed stars within an outer surrounding slit. The dimensions of a slit are measured in terms of its land (which is the measurement along the direction of the resin flow), and its cross-section, which is made up of the width and the length, the width of the slit being the lesser of these two latter dimensions. In general the land of a slit is greater than the width, and is preferably from 5 to 50 times, for example from 10 to 20 times the width.

The overall thickness of the foamed resin sheet is often from 0.5 to 1.5 inch and is preferably about 1 inch. The individual foamed elements can for example be from 0.05 to 0.2 inch thick and are preferably about 0.1 inch thick. They often have a closed-cell structure, the average diameter of the cells being for instance from 0.002 inch to 0.1 inch, preferably from 0.004 inch to 0.01 inch.

The density of the foamed resin elements is preferably such that the sheet as a whole has an overall density of between 1 and 3 pounds per cubic foot and particularly between 1 and 2 pounds per cubic foot. Very often the overall density will be about 1.5 pounds per cubic foot. The foamed resin elements will then often have a density of from 1 pound to 5 pounds per cubic foot, for example from 2 to 4 pounds per cubic foot.

The insulating sheet of the invention is of a width corresponding to the distance between the beams of the roof or floor. For example it is often advantageously about 14 inches wide, in which form it may be laid between roofing joists which are commonly 2 inches thick and laid with their centres 16 inches apart. The material is compressible and widths slightly greater than the distance between the beams are accordingly possible.

In use the insulating material of the invention is flexible, can be stored in rolls, is non-dusting, safe and easy to cut to size.

WHAT WE CLAIM IS:—

1. An insulating material suitable for laying between the beams, particularly the joists, of a roof or floor, comprising a flexible hollow extruded foamed polyolefin resin sheet having a cross-section in the form of a network of interconnected foamed polyolefin resin elements, an overal thickness of from ½ to 2 inches, and an overall width corresponding to the distance between the beams.

2. An insulating material according to Claim 1, in which the polyolefin is polyethylene.

3. An insulating material according to either of Claims 1 or 2, in which the network of elements is an approximately rectangular network.

4. An insulating material according to either of Claims 1 and 2, in which the network of elements is an approximately triangular network.

5. An insulating material according to any of the preceding claims, of which the overall thickness is from 0.5 inch to 1.5 inch.

6. An insulating material according to any of the preceding claims, in which the individual foamed elements are from 0.05 to 0.2 inch thick.

7. An insulating material according to any of the preceding claims, in which the foamed elements have a closed cell structure, the average diameter of the cells being from 0.004 inch to 0.01 inch.

8. An insulating material according to any of the preceding claims, in which the density of the foamed resin elements is such that the sheet as a whole has an overall density of between 1 and 2 pounds per cubic foot.

9. An insulating material according to Claim 8, in which the density of the foamed resin elements is from 2 to 4 pounds per cubic foot.

10. An insulating material according to any of the preceding claims, which has a width about 14 inches.

11. An insulating material according to any of the preceding claims, which has been produced by extruding a foamable resin composition through a die having at its outlet end a number of slits arranged in the form of a network, each slit having communicating with it a plurality of separate channels at the inlet end of the die.

12. An insulating material substantially as herein described with reference to and illustrated in the accompanying drawings.

13. A method of insulating a roof or floor of a building, which comprises laying between the supporting beams an insulating

material according to any of the preceding claims.

14. A building having a roof or floor that has been insulated by a method according to Claim 13.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig.1.

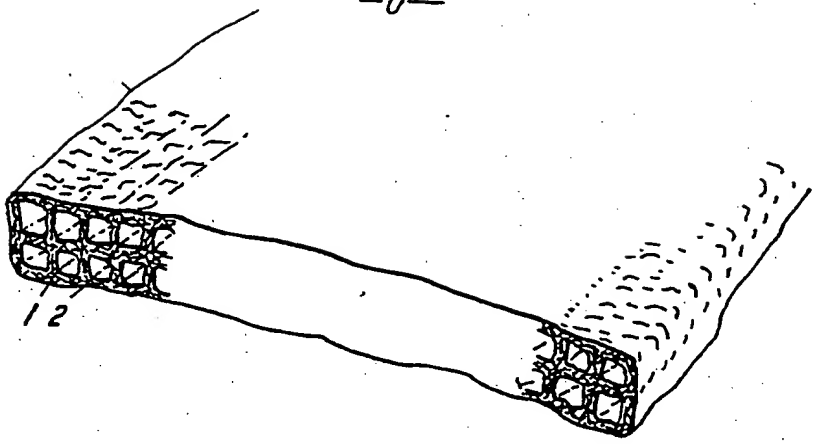

Fig.2.